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(54) Spot-type Disc Brake

(57) In a spot-type disc brake, even distribution of the actuating force of a mechanically or hydraulically actuated brake-applying piston (14) onto the backing plate (13), of a brake shoe (12) of rectangular or circle-segmental shape is achieved by providing a pressure plate (11) between the brake shoe and the piston which pressure plate (11) is adapted to the contour of the backing plate (13) on the side close to brake shoe (12) and is adapted to the contour of the end face (15) of the piston (14) on the side close to the piston (14).

As shown, the pressure plate (11) has an abutment surface (16) engaging piston (14) and abutment surfaces (20, 21) engaging backing plate (13). Pressure plate (11) and piston (14) are clamped together by a retaining spring (28). Figures 6—9 show a modification of such spring.

A retaining spring (46) is disposed between pressure plate (11) and backing plate (13)—set pins (24, 25) on pressure plate (11) extend into bores (50) in the backing plate (13).

Instead of a single piston two circumferentially spaced hydraulic pistons may be used.

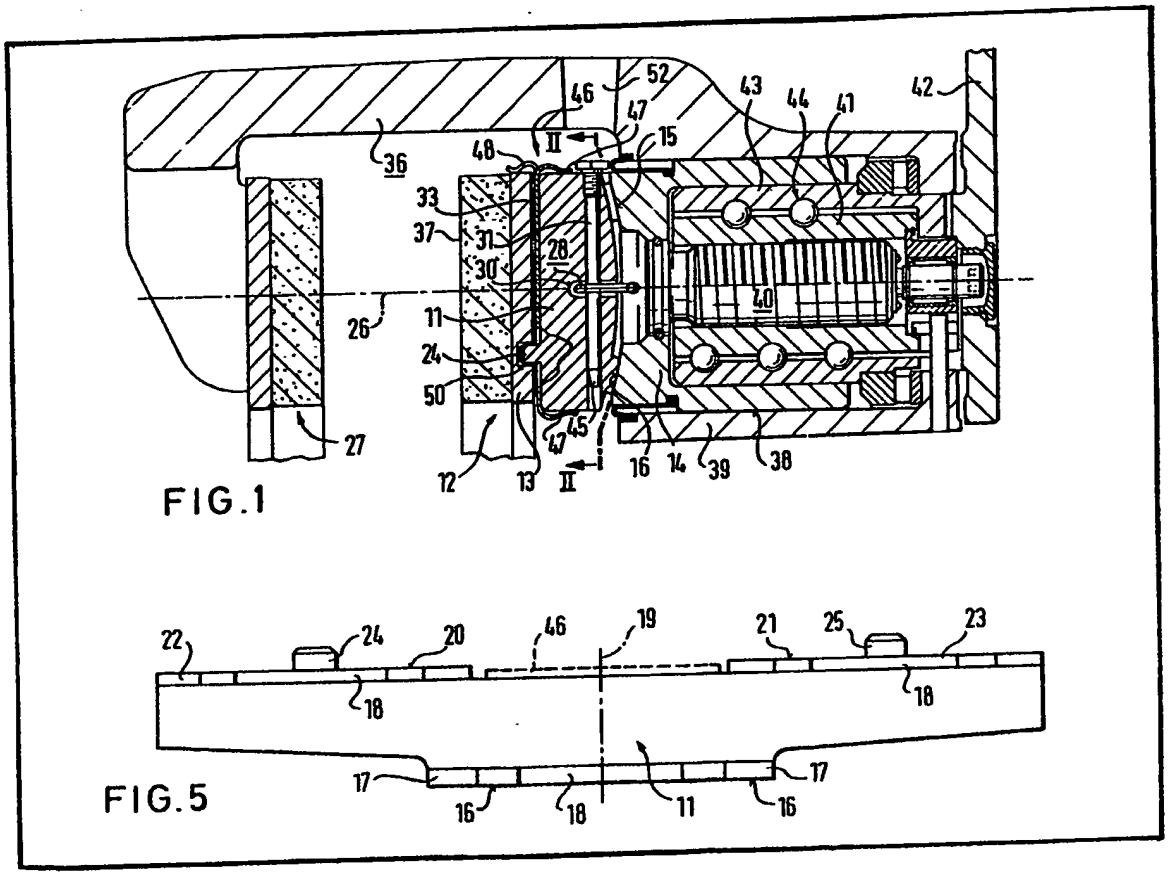

FIG.1

FIG.5

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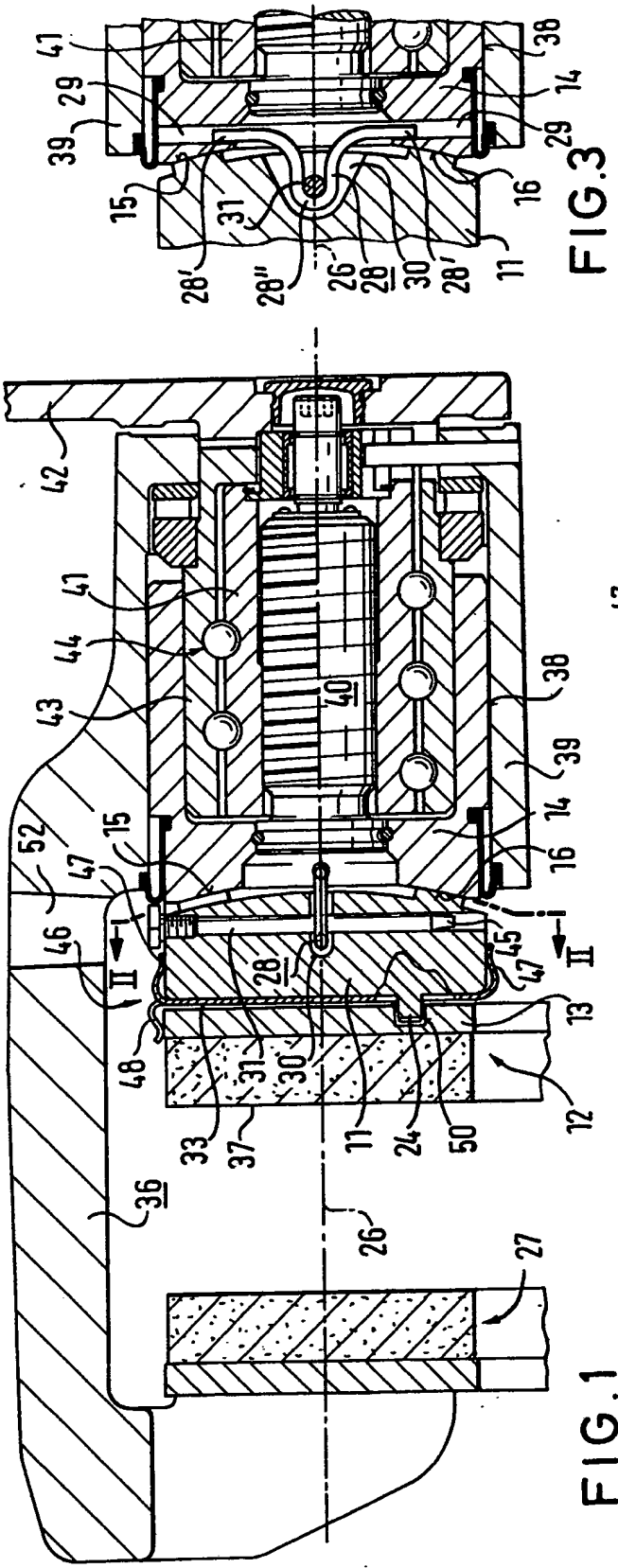


FIG.1

FIG.3

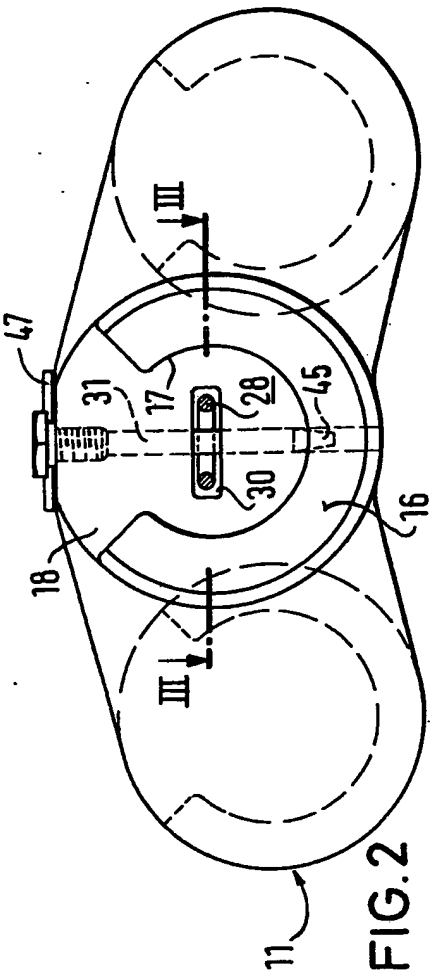
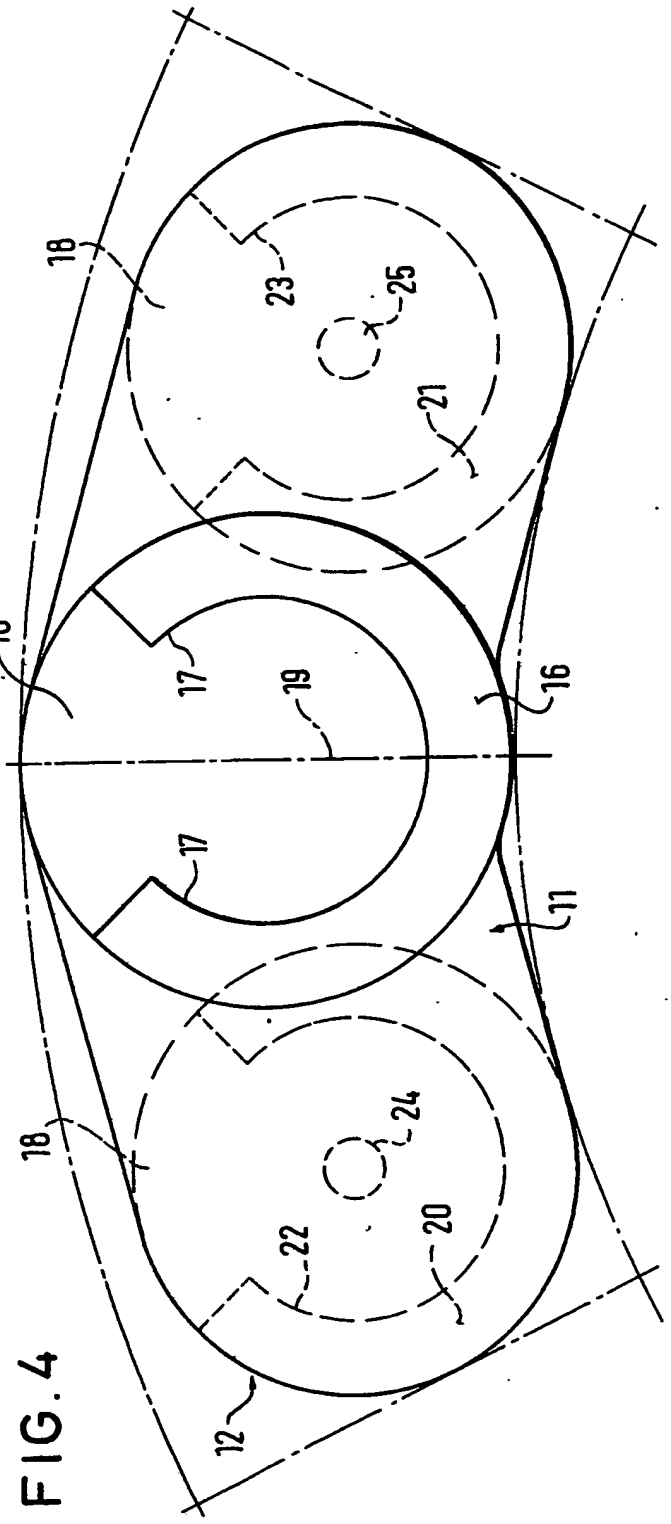


FIG.2


18
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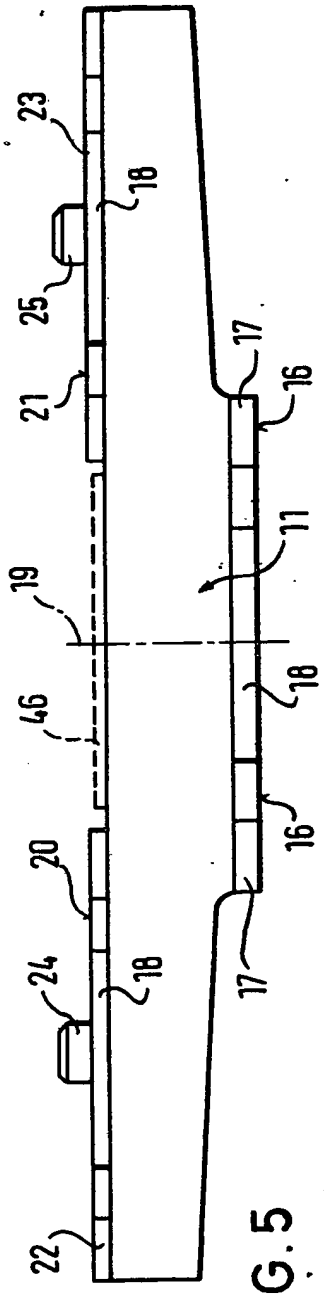
12

FIG. 4


23
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22

FIG. 5

FIG.9

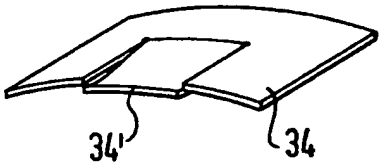


FIG.7

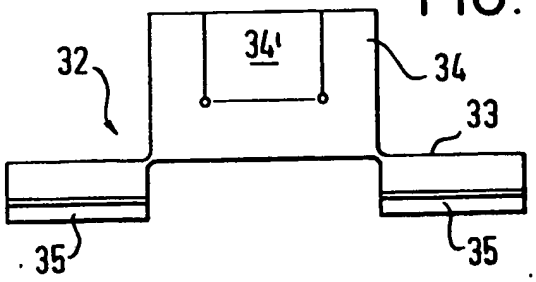


FIG.8

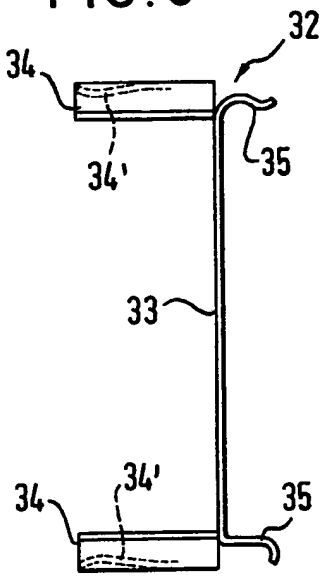
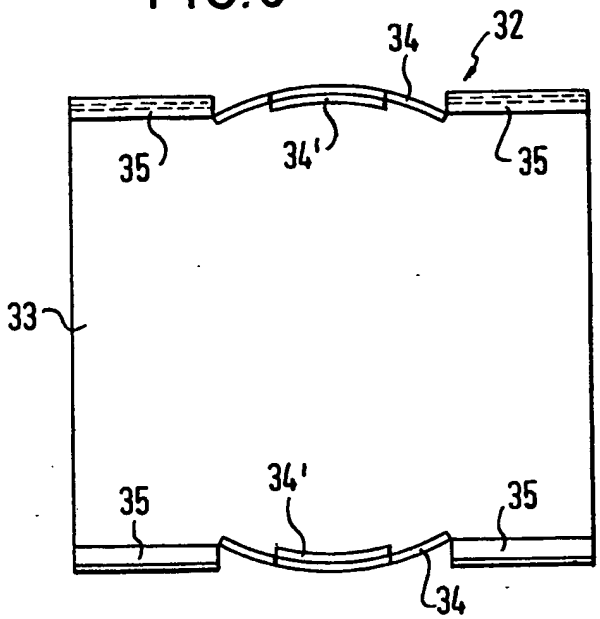


FIG.6



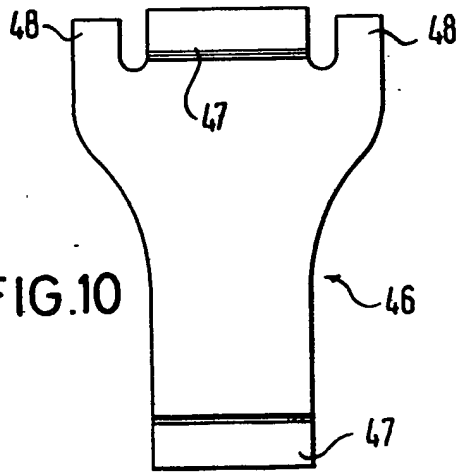


FIG.10

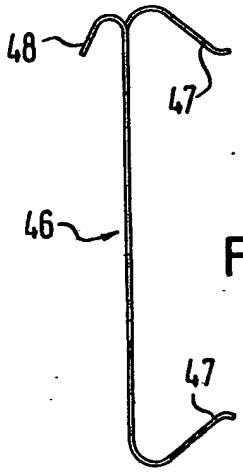


FIG.11

SPECIFICATION

Spot-type Disc Brake

This invention relates to a spot-type disc brake of the type having a central, preferably circular, brake shoe-applying member and a brake shoe of rectangular or circlesegmental shape as well as a pressure plate arranged symmetrically between the brake shoeapplying member and the brake shoe.

It is already known (German Patent Specification DE-AS 1 047 643) to arrange a pressure plate between a brake shoe-applying member in the shape of a lever and the brake shoe of a spot-type disc brake in order to convert the tilting movement of the lever into a purely linear movement of the brake shoe.

It is an object of the present invention to provide a spottype disc brake of the type initially referred to, by which a force is centrally introduced by the brake shoe-applying member can be evenly distributed onto the backing plate of a brake shoe, which is oblong in a circumferential direction.

According to the invention in its broadest aspect, there is provided a spot-type disc brake of the type having a central, preferably circular brake shoe-applying member and a brake shoe of rectangular or circle-segmental shape as well as a pressure plate arranged symmetrically between the brake shoe-applying member and the brake shoe, characterised in that the contour of the pressure plate is adapted to the contour of the backing plate on the side close to the brake shoe and is adapted to the contour of the end face of the brake shoe-applying member on the side close to the brake shoe-applying member.

In particular, the side of the pressure plate close to the brake shoe-applying member has an abutment surface of substantially circular shape, the diameter and the width of this abutment surface being accommodated to the dimensions of the end face of the brake shoe-applying member. The abutment surface is suitably formed at an annular collar, which projects axially, is of circular shape and which may have an aperture at the outer side for shifting the point of application of force at the pressure plate inwardly.

Two backing plate abutment surfaces are to be provided symmetrically relative to the intermediate disc radius on the side of the pressure plate opposite to the abutment surface, which backing plate abutment surfaces abut at the same backing plate. In this structure, set pins are arranged in particular in the middle of the backing plate abutment surfaces which engage in corresponding bores of the backing plates.

Although in accordance with an embodiment of the present inv ntion, there is provided only one central brake shoe-applying member. For example a mechanically or hydraulically actuated brake piston, a brak shoe can b employed as in conventional practice with brakes having two hydraulic pistons arranged side by sid in circumfer ntial direction. The pressure plate in accordance with the present invention allows an even distribution of th centrally applied brake force onto the entire surface of the oblong brake shoe or its backing plate.

Furthermore, the present invention takes into consideration that the maximum possible diameter of a circular brake shoe-applying member does not alone ensure an even pressure distribution at the brake shoe, because the latter is designed to be considerably longer in a circumferential direction than in a radial direction.

Instead of being of circular design, the abutment surface or the backing plate abutment surface may also be of oval design. The construction in accordance with the present invention avoids a flexure of the carrier or backing plate of the brake shoe.

The apertures of the abutment surface, the backing plate abutment surfaces or of the annular collars are expedient to reduce the point of application of force.

The mounting of the brake show backing or carrier plate at the pressure plate is achieved on the one hand, by the above-mentioned set pins. Moreover, a spring clip may be provided for this purpose which will be described hereinafter.

To the end that the pressure plate is able to adjust its position relative to the brake shoe-applying member in two planes extending vertically on one another and being disposed in the axis, in a particularly preferred embodiment, the abutment surface of the pressure plate and the corresponding contact end face of the brake shoe-applying member are designed spherically. The central point of the spherical surface is desired to be placed on the axis of the brake shoe-applying member as well as suitably on the side of the brake shoe remote from the brake shoe-applying member. The central point of spherical surfaces is preferably located approximately in the area of the opposite brake shoe.

A partial overload of the brake shoe in the event of high brake loads is avoided by a spherical torsion being possible between pressure plate and brake shoe-applying member.

The contact surface between the pressure plate and the brake shoe-applying member being of spherical design affords a certain positive engagement with corresponding degrees of freedom between these two elements. The spherical design of the thrust bearing between the brake shoe-applying member and the pressure plate consequently affords an optimum transmission of the brake force under any braking conditions.

The pressure plate and the brake shoe-applying member are desired to be clamped together by a retaining spring, in order to attain a continuous abutm nt in the area of the sph rical thrust bearing. For this purpose, the retaining spring can have two straight end pl ces supported in radial bores of the brake shoe-applying member and a bracket member extending in a central recess of the pressure plate, engaging into which bracket member is a bolt which is inserted diametrally in

th pressure plate. This bolt is to be of wedge-shaped design at its inserting end so that a stressing of the bracket-like retaining spring is effected when fitting the bolt into th bracket.

In accordance with another embodiment, the retaining spring can be a spring clip which is in yielding clamping engagement with both the pressure plate and with the brake shoe-applying member. This spring clip is, in particular, desirably composed of a plane spring shim which is placed flat between the pressure plate and the brake shoe-applying member and which has spring tongues projecting essentially axially at its radially outward and inward end portions staggered in a circumferential direction relative to the pressure plate or to the brake shoe-applying member which spring tongues bear radially outwardly or inwardly resiliently against the radial outer rims of the pressure plate or the brake shoe-applying member. In particular, the construction is desired to be such that spring tongues which are bent centrally radially outwardly and inwardly around the axis of the brake shoe-applying member and which are of comparatively great length extend from the rim of the spring shim to the brake shoe-applying member and come into clamping abutment thereon, and that comparatively short spring tongues extend in a circumferential direction next thereto on both sides likewise radially outwardly and inwardly over the outer rims of the pressure plate and come into clamping abutment thereon.

To secure the brake shoe to the pressure plate, according to a particularly favourable embodiment, a retaining spring having a plane mid-portion is provided between the carrier plate and the pressure plate, which retaining spring includes two intermediate spring arms lying opposite each other and embracing the outer rim of the pressure plate, whilst on the opposite side two smaller spring arms abutting the radially outer rim of the brake shoe are provided which press the brake shoe radially inwardly against the holding member of a pressure plate. In this structure, the holding member preferably consists of at least two holding bolts being forced in bores in the pressure plate and extending in bores in the carrier plate of the brake shoe, for which purpose the plane mid-portion of the retaining spring includes corresponding bores.

Adjustability in the two planes is achieved without great effort by virtue of the retaining spring in accordance with the present invention and the retaining bolt defining it. Besides, the inventive form of the spring and of the pressure plate is designed to serve as a torsion-preventing mechanism between the brake shoe-applying m mber and the pressure plate. In addition to this, it is the retaining spring's purpose to interconnect the pressur plate and the brake shoe-applying m mber and to prevent a rattling of both parts.

The arrangem nt of the retaining spring is meant to inhibit the freedom of movem nt of the pressure plate, on the one hand, and of the brake shoe ba king plate, on th other hand. More ver, when the actuating unit is released, the retaining spring is desired to disengage the brake lining from the disc by m ans of the overlapping spring tongues. A supporting force lining backing plate/lining backing plate-holding device is exerted by the spring tongues which extend over the backing plate in a fist-type caliper disc brake. Thus, there is only one spring tongue bearing against the backing plate, so that lining replacement may be carried out even when the bridge-portion of the caliper is hinged upwardly.

An essential advantage of the bearing of the pressure plate is that additional friction forces occurring with the bearing of the pressure plate, for instance, in the bridge-portion of the caliper, do not endanger the complete release of the lining when the brake is not applied.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a radial axial sectional view of a spot-type disc brake in accordance with the present invention with a first embodiment of a retaining spring,

Fig. 2 is a section taken along the line II-II in Fig. 1,

Fig. 3 is a section taken along the line III-III in Fig. 2,

Fig. 4 is an enlarged back view of the pressure plate in accordance with the present invention,

Fig. 5 is a radial view of the pressure plate in accordance with the present invention,

Fig. 6 is a front view of another embodiment of a retaining spring to be located between brake shoe-applying member and pressure plate,

Fig. 7 is a radial view of the retaining spring according to Fig. 6.

Fig. 8 is a view of the retaining spring in circumferential direction,

Fig. 9 is a perspective view of a spring tongue 34 of the retaining spring according to Figs. 6 through 8,

Fig. 10 is a topview of a retaining spring to be located between the carrier plate and pressure plate, and

Fig. 11 is a side view of the retaining spring according to Fig. 10.

Figs. 1 to 3 show a fist-type caliper brake with a caliper 36 embracing the brake disc (not shown), with an outer indirectly-actuated brake shoe 27 and an inner directly-actuated brake shoe 12 which is composed of a carrier or backing plate 13 and the brake lining 37.

Inserted between the backing plate 13 and a pressure plate 11 acting on it is a spring shim 33 which will be described in more detail later.

The pressure plate 11 is, via a spherical annular surface 16, in abutment with an nd fac 15 of correspondingly spherical design of a brake shoe-applying member 14 which is formed as a type of piston being located axially movably in a cylinder bore 38 of the one caliper leg 39. The piston 14 is acted upon by an adjusting spindle 40 which may be subjected to an axial force by an

actuating spindle 41. This axial force is generated by an actuating nut 43 which is adapted to be rotated by an actuating lever 42 and which is connected to the actuating spindle 41 via a ball bearing thread 44. When tilting the actuating lever 42 around the axis 26, the piston 14 will be advanced in the direction of the brake disc.

According to Figs. 1 to 5, the pressure plate 11 is of oblong design in a circumferential direction. It has an abutment surface 16 provided at an annular collar 17 on the side close to the type piston 14, which abutment surface is shown spherically solely in Fig. 1. The annular collar 17 and the abutment surface 16 are interrupted in the radially outer area at reference numeral 18 in order to displace the point of application of the force of the piston 14 to the inside.

Provided on the opposite side at the pressure plate 11 on both sides symmetrically relative to the median radial plane 19 are further annular collars 22, 23 with abutment surfaces 20, 21 which are in engagement with the backing plate 13. The abutment surfaces 20, 21, too, show in the radially outer area at reference numeral 18 the same aperture as the abutment surface 16.

Set pins 24, 25 are provided in the middle of the annular collars 22, 23 which pins engage in corresponding bores 50 of the backing plate 13 (Fig. 1).

Provided in the middle of the pressure plate 11 on the surface close to the piston 14 is a recess 30 in which engages the bracket member 28″ of a bracket-shaped retaining spring 28, whose straight radial end pieces 28′ are accommodated in bores 29 of the piston 14 extending in a circumferential direction. According to Figs. 1, 2, a retaining bolt 31 extends radially from the outside in a corresponding bore of the pressure plate 11. The bolt 31 penetrates the recess 30 as well as the bracket member 28″ of the clip spring 28. Since the tip 45 of the bolt is of wedge-shaped design, the bolt 31 is able to stress the clip spring when being inserted in such a way that the spherical surfaces 15, 16 are pressed resiliently on each other.

According to Figs. 1, 10 and 11, a retaining spring 46 disposed between the pressure plate 11 and the backing plate 13 is designed essentially as a plane spring shim 33, which is located between the pressure plate 11 and the backing plate 13. At its radially outer and inner ends, the spring plate has in its mid-portion spring tongues 47 which project to the piston 14 and move from the outside into resilient abutment with the pressure plate 11 and clamp it.

Extending in a circumferential direction on both sides next to th intermediate spring tongue 47 and over the radial outer rims of the backing plate 13 are spring tongues 48 which b ar against the outer rims in a clamped relationship thereto.

According to Figs. 1, 10 and 11, the retaining spring 46 is radially outwardly of comparativ ly wide design and is designed from its plane mid-portion to the radially inward end portion so narr w that the two set pins 24, 25, which are forced in bores of the pressure plate 11 and extend into bores 50 in the carrier plate 13 of th brake shoe 12, are placed beside the retaining spring 46.

The assembly of the brake shoeapplying member 14 including the pressure plate 11 attached thereto by the holding device 28, 31 is carried out in such a way as to insert the brake shoeapplying member axially in the bore 38 of the caliper. The axial width of the caliper allows this arrangement. Another possibility is that the retaining bolt 31 according to Fig. 1 will be inserted subsequently into the pressure plate 11 through a radial bore 52 in the brake caliper.

As indicated in broken lines in Fig. 5, the height of the annular collars 22, 23 somewhat exceeds the thickness of the shim of the retaining spring 46, resulting in the retaining spring 46, which fits between the annular collars, having sufficient free space, even if the brake shoes are applied to the brake disc.

An alternative replacing the retaining spring 28 is illustrated in Figs. 6 to 9. The retaining spring 32 shown there in detail includes radially inwardly and outwardly extending spring tongues 35 which are of a comparatively short design and are desired to extend over the pressure plate 11 in order to clamp it resiliently. Spring projections 34 which are likewise bent radially inwardly and radially outwardly are situated between the relatively short axial spring tongues 35, viewed in a circumferential direction, which spring projections are designed to overlap axially the brake shoe-applying member 14. Resilient tongues 34′ which are curved somewhat inwardly serve to produce a firm resilient frictional engagement with the brake shoe-applying member 14. The plane mid-portion 33 of the retaining spring 32 is arranged between the pressure plate 11 and the brake shoe-applying member 14, with the surfaces of the pressure plate 11 and of the brake shoe-applying member abutting each other being plane when the retaining spring according to Figs. 6 to 9 is used.

The assembly of the spot-type disc brake in accordance with the present invention can be effected as follows:

First of all, by being compressed, the clip spring 28 is brought into alignment with its straight end pieces 28′ with the radial bores 29 of the piston 14. When the clip spring is released, the straight end pieces 28′ enter the radial bores 29. The pressure plate 11 is now inserted from the inside onto the clip spring 28, until the spherical surfaces 15, 16 are in contact with each other. The recess 30 is of such a flat design that the clip spring will now take the position shown in Fig. 3.

Bolt 31 will b inserted in the pressure plate, so that the pressure plat 11 is clamped resiliently with the piston 14. Rotational mov m nt is, however, still possibl of th pressure plate 11 in two planes along the spherical surfaces 15, 16.

Subsequently, the spring clip 46 will be attached to the end face of the pressur plat 11

close to the disc. The brake shoe 12 can now be mounted onto the set pins 24, 25 of the pressure plat 11, while the spring tongues 48 shift themselves resiliently onto the radial outer rim of the backing plate 13. The plane spring shim is so narrow that the two pins 24, 25 and the annular collars 22, 23 are able to extend laterally past the spring.

Claims

1. A spot-type disc brake of the type having a central, preferably circular brake shoe-applying member and a brake shoe of rectangular or circle-segmental shape as well as a pressure plate arranged symmetrically between the brake shoe-applying member and the brake shoe, characterised in that the contour of the pressure plate is adapted to the contour of the backing plate on the side close to the brake shoe and is adapted to the contour of the end face of the brake shoe-applying member on the side close to the brake shoe-applying member.

2. A spot-type disc brake as claimed in claim 1, characterised in that the side of the pressure plate close to the brake shoe-applying member has an abutment surface of substantially circular shape, the diameter and the width of it being accommodated to the corresponding dimensions of the end face of the brake shoe-applying member.

3. A spot-type disc brake as claimed in claim 2, characterised in that the abutment surface is formed at an annular collar which is axially projecting and is of circular shape.

4. A spot-type disc brake as claimed in claim 2 or 3, characterised in that the abutment surface or the annular collar has an aperture on the outer side.

5. A spot-type disc brake as claimed in claim 4, characterised in that the aperture extends symmetrically relative to the disc radius passing through the central point of the abutment surface over an angle of 80 to 100° and preferably of about 90°.

6. A spot-type disc brake as claimed in any one of claims 2 to 5, characterised in that two backing plate abutment surfaces are provided on the side of the pressure plate opposite to the abutment surface symmetrically relative to the intermediate disc radius.

7. A spot-type disc brake as claimed in claim 6, characterised in that the backing plate abutment surfaces are formed at annular collars which project axially and are of circular shape.

8. A spot-type disc brake as claimed in claim 6 or 7, characterised in that the backing plate abutment surfaces or the annular collars have an aperture on the radially outer side.

9. A spot-type disc brake as claimed in any one of claims 6 to 8, characterised in that set pins are provided in the middl of the backing plate abutment surfaces which engage in corresponding bores of the backing plate of the brake sho .

10. A spot-type disc brake as claimed in any one of the preceding claims, characterised in that the abutm nt surface of th pressur plate and the corresponding end face of the brake shoe-applying member are of spherical design.

11. A spot-type disc brake as claimed in claim 10, characterised in that the central point of the spherical surfaces is placed on the axis of the brake shoe-applying member.

12. A spot-type disc brake as claimed in claim 11, characterised in that the central point of the spherical surfaces is placed on the side of the brake shoe remote from the brake shoe-applying member.

13. A spot-type disc brake as claimed in claim 12, characterised in that the central point of the spherical surfaces is placed approximately in the area of the opposite brake shoe.

14. A spot-type disc brake as claimed in any one of the preceding claims, characterised in that the pressure plate and the brake shoe-applying member are clamped together by means of a retaining spring.

15. A spot-type disc brake as claimed in claim 14, characterised in that the retaining spring includes two straight end pieces which are supported in radial bores of the brake shoe-applying member and a bracket member which extends into a central recess of the pressure plate and in which a bolt engages, the bolt being inserted diametrally in the pressure plate and extending preferably radially.

16. A spot-type disc brake as claimed in claim 14, characterised in that the retaining spring is a spring clip which is in resilient clamping engagement with both the pressure plate and the brake shoe-applying member.

17. A spot-type disc brake as claimed in claim 16, characterised in that the spring clip is composed of a plane spring shim which is placed flatly between the pressure plate and the brake shoe-applying member and which has spring tongues projecting essentially axially at its radially outward and inward end portions staggered in a circumferential direction relative to the pressure plate or to the brake shoe-applying member, the spring tongues bearing radially outwardly or inwardly resiliently against the radial outer rims of the pressure plate or of the brake shoe-applying member.

18. A spot-type disc brake as claimed in claim 17, characterised in that the spring tongues which are bent centrally radially outwardly and inwardly extend from the rim of the spring shim to the brake shoe-applying member and come into clamping abutment thereon, and in that spring tongues extend in a circumferential direction next thereto on both sides likewise outwardly and inwardly over the outer rims of the pressure plate and come into clamping abutment there n.

19. A spot-type disc brak as claimed in any one of the preceding claims, characterised in that a retaining spring having a plane mid-portion is provided between the carrier plate and the pressure plate, this retaining spring having two intermediate spring arms lying opposite each

other and embracing th out r rim of the pressure plate, while two smaller spring arms abutting the radially outer rim of the brak shoe ar provided on the opposite side, these spring arms urging th brake shoe radially inwardly against a holding member of a pressure plate.

20. A spot-type disc brake as claimed in claim 19, characterised in that the holding member is composed of at least two holding bolts which are forced into bores in the pressure plate and extend in bores in the carrier plate of the brak shoe, for which purpose the plan mid-portion of th retaining spring is of correspondingly narrow design.

21. A spot-type disc brake substantially as described with reference to the accompanying drawings.

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